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Research Article

Developing a video-animated learning media of the human skeletal system using Powtoon

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Abstract: One is that audio-visual media can help students think creatively and find their understanding in mastering the material being taught, namely animated videos. An Animated video is a video that contains a movement of objects that are designed to be attractive with a specific purpose. This study aims to produce appropriate animated video learning media on human movement system material for class XI SMA Pekanbaru students. This study uses the ADDIE development model which consists of the stages of analysis, planning, development, implementation, and evaluation, and this research only reaches the development stage. Determination of the sample using a random sampling technique, and the number of samples is 10 students from each school. The data obtained in the development of this animated video media was by validating the material, media, and teachers, as well as looking at student responses to the media which was developed using student response questionnaires. The data analysis technique used the scale method with a Likert modification. The results of the validation by experts were in the Very Valid category and received very good responses from students. Based on the results of the validation and student responses, it can be seen that the validity level is very valid and it can be stated that the animated video learning media developed is very valid for use in learning. In addition, this animated video learning media still needs to be continued to the implementation and evaluation stages.

Keywords: human skeletal system; Powtoon; video animated learning

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1. Introduction

Learning media are all things that are used by education to students as a means of conveying information in the learning process. Learning media is a way, tool, or process used to convey messages from message sources to message recipients that take place in the learning process (Supardi et al., 2015). Teachers must have sufficient knowledge and understanding of learning media because media is an integral part of the teaching and learning process in order to achieve educational goals in general and educational goals in schools in particular (Abuhassna et al., 2020; Coman et al., 2020; Kim et al., 2019). The use of learning media can help the effectiveness of the learning process. In addition to being able to arouse student motivation and interest, learning media can help students improve understanding, present data in an interesting way, facilitate interpretation of data, and condense information (Mellisa & Fitri, 2022).

Learning media has various formats in conveying information/messages, including in the form of visual, audio and audio-visual formats. Learning by utilizing audio-visual media is the production and use of material whose application is through sight and hearing and does not entirely depend on understanding words or similar symbols (Shafira & Rosita, 2022; Winarto et al., 2020). Audio-visual media is a type of media that can be

used in learning activities by involving the senses of hearing and sight as well as in one process or activity (Rofina & Mellisa, 2022).

Learning media consisting of elements of images, writing and sound can increase attention, bring students to understand ideas and get very complex information (Widiyasanti & Ayryza, 2018). Animated video is a video that contains a movement of objects that are designed to be attractive with a specific purpose. Animation is a process of recording and playing back a series of static images to create an illusion of movement. This animated video will increase students' interest in learning because of its attractive appearance (Buchari et al., 2015). Biology is a scientific discipline consisting of many abstract concepts and processes of events. This causes students not to be motivated in learning biology. Apart from that, students also think that biology contains a lot of rote texts, especially when it comes to processes (Maryanti & Kurniawan, 2018). Animated videos can explain something that is complicated and difficult to explain through pictures and words so it's easy to understand. Therefore, video animation is very well used for material that can't really be seen by the eye to be better illustrated in a visual form (Noviyanto et al., 2015).

One of the materials in class XI Science-Biology learning is the Human Movement System. The Human Movement System is material that takes place physiologically in the human body such as the forms of muscles and the mechanism of action of muscles. Therefore, in this material students cannot see directly how muscles form and the mechanism of muscle work, so that the role of the media is needed in this material to make it easier for students to understand this material. In addition to animated videos related to learning material that can attract the attention of students to study the material being taught because it is not monotonous. The use of learning media is expected to make it easier for teachers to convey learning material and students can master the material that has been given (Aprianty et al., 2021). Some assessments regarding the development of animated video-based learning media used for high school get very decent results from expert validators, teachers and get very good responses from students (Fadilah et al., 2015; Sari et al., 2017; Yusuf et al., 2017).

Based on observations related to the condition of students during learning, it was found that students tended to like learning using audio-visual based media rather than the lecture method because when learning took place more students paid less attention to learning and also the rapid development of science and technology students were much more interested in audio visual learning media. During the observation, the teacher tended to use a projector to display Power Point only, so that no animation video learning media had ever been developed at that school. This is especially in the material on the Human Movement System for class XI students at the high school. In this case, the researcher develops media in the form of Video Animation which will later contain material explanations accompanied by several illustrations of the mechanisms according to the material presented in order to support the achievement of learning objectives. This study aims to produce appropriate animated video learning media on human movement system material for class XI SMA Pekanbaru students.

2. Material and Methods

This research was conducted in 3 Pekanbaru city high schools, namely SMA IT At-Ittihad Pekanbaru, SMA Olahraga Riau and SMA PGRI Pekanbaru. In this development study, researchers used the ADDIE model as a design that researchers considered suitable for use in this study. The ADDIE model is the main component of the systems approach to developing learning, and development procedures in learning (Suryani et al., 2018). The ADDIE research consists of five stages, namely Analyze, Design, Development, Implementation, and Evaluate (Cahyadi, 2019). In this study, researchers only carried out up to the third stage, namely the development stage. The ADDIE model was chosen because it is in accordance with the problems underlying this research, there is curriculum analysis, needs analysis and looks at the characteristics of students and the existing conditions.

The ADDIE (Analysis to Development) steps applied in this study are presented in Figure 1.

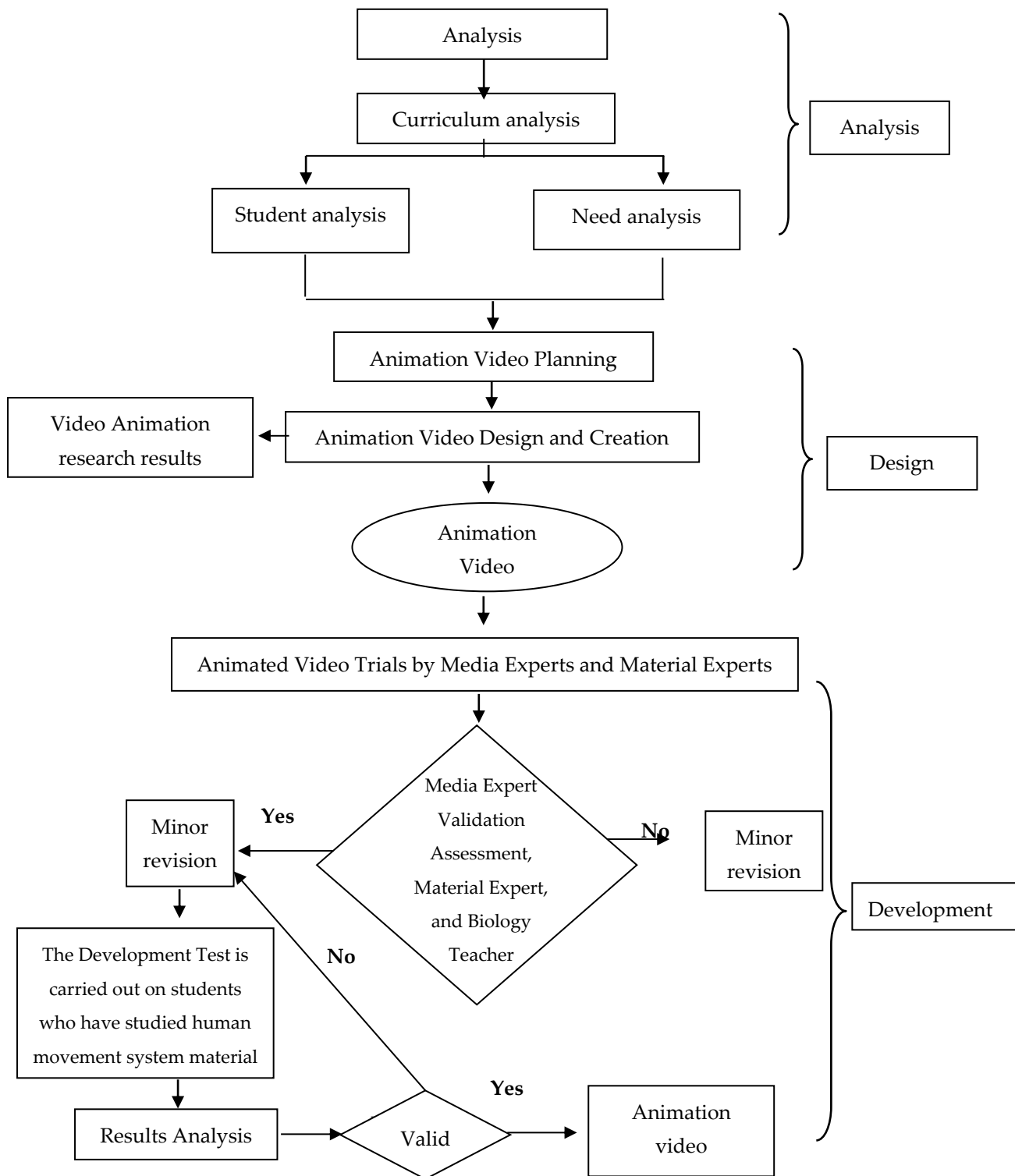


Figure 1. ADDIE steps (from the analysis stage to the development stage) (Mellisa & Yanda, 2019).

The instruments used to collect data were product validation sheets and student response questionnaires which were distributed via the Google form link. Preliminary data was obtained by providing initial needs questionnaires to teachers and students. Giving an initial needs questionnaire is used to see the needs of students and teachers regarding animated videos and also as a basis for desired and needed animated videos. The final data obtained from the results of expert validation are analyzed to determine the criteria

of the product that has been developed. The validator provides general impressions, suggestions and criticisms for the products produced. Furthermore, the data was obtained through validation by Biology Teachers at SMA/MA and students' responses to learning media by providing product assessment instruments through the Google form. Product validation is carried out by showing animated videos and validation sheets to the validator. Data analysis technique using the Likert Scale method. After the results of each validation test are known, in order to obtain conclusions from all the results of the validity of each expert, teacher and student, it can be adjusted or confirmed with validity criteria such as Table 1.

Table 1. The validity criteria of the validator and the results of product assessment by the teacher

No.	Percentage scale (%)	Criteria
1.	85.01-100	Very valid, can be used without repair
2.	70.01-85	Fairly valid, usable but needs minor improvements
3.	50.01-70	Invalid, need major improvement
4.	1.00-50	Invalid, cannot be used

3. Results

3.1 Stage 1: Analyze

The initial stage in this research is the analysis phase. The first step that the researchers took was to analyze the curriculum applied in schools as a reference in making animated video learning media. This stage aims to determine which material is used in making animated video media. The curriculum that is applied in schools is the 2013 curriculum. Next is the needs analysis stage. This stage aims to determine the needs of students so that they are more motivated to learn. At this stage the researcher conducted interviews with students and biology teachers and got the result that there was not enough variety of learning media used, there was no use of animated video media in the learning process and the existing infrastructure at school had not been utilized optimally. After that is the analysis of students. Based on the results of the interviews that have been conducted, the researcher can conclude that some of the characteristics of students in learning biology include: students quickly feel bored and are less interested in learning biology, especially in motion system material due to the lack of variety of learning media used by the teacher.

3.2 Stage 2: Design

This stage is known as making a product design (blueprint). The design stage consists of media designed in the form of animated videos consisting of learning objectives, materials, examples and also application in everyday life. This animated video learning media will be 10-15 minutes long which contains the movement system sub-material, namely muscle mechanics. This video animation learning media uses Indonesian and is also equipped with several filters and sound with the creation of using the Powtoon application to produce interesting videos.

3.3 Stage 3: Development

The development stage has the goal of producing video animation learning media that is in accordance with the curriculum used, namely the 2013 curriculum. The learning media that has been prepared will be validated by the validator. In this development stage the conceptual framework can be realized in the form of product development that is ready to be implemented according to the objectives.

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students so that it can take place in an effective and efficient manner. . The aspect of the state of the device in this learning media is considered good so that it can be used for students.

The display aspect consists of seven indicators, namely the display of the opening title, the display of the opening animation, the suitability of the location of the animation, the quality of the animation, the color composition, the moving media (animation/movie) and the readability of the text. From the validator (RM), the display aspect gets an average percentage of 78.57% with a fairly valid level of validity, so that in terms of the display aspect, the device is quite valid to use. The appearance of media that has sufficient validity means that this learning media has an attractive appearance that can help students understand the material being taught.

The audio aspect consists of one indicator, namely the suitability of the sound with the picture. In the aspect of the audio validator (RM) it gets an average percentage of 100% with a very valid level of validity so that in terms of the audio aspect the device is very valid to use. From the results of the validity percentage obtained, it is stated that this learning media has very good audio to support the delivery of material from the animation displayed so that it makes it easier for students to understand the display of the animation shown in the video.

3.3.2 Learning Media Validation by Material Experts

Material validation can be seen from the sequence of materials and study materials. Material validation is done via email by providing an animated video link and a validation form to the material expert. The validation results of interactive e-book learning media by material experts are presented in [Table 3](#).

Table 3. Results of validation of animation video learning media by material experts

No.	Name of Validator	Rated aspect	Eligibility Percentage (%)	Validity Level
1.	NH	Content eligibility	90.62 %	Very Valid
The media expert's average assessment of all aspects			90.62 %	Very Valid

Based on [Table 3](#), it can be seen that research on animated video learning media by material experts has a feasibility level that is very feasible. At this stage it is known that the content feasibility aspect of the validator (N.H) gets a percentage of 90.62%. Overall, the feasibility level for animated video learning media by material experts is very valid without revision with an average percentage of 90.25%.

The content feasibility aspect consists of eight indicators, namely clarity of learning objectives, suitability of material with learning objectives, coherence, easy-to-understand explanation of material, depth of material, clarity of learning instructions in the process of using media, use of language, usefulness of material. From the validator (NH) as a whole the content eligibility aspects get an average of 90.62% thus if converted into eligibility criteria, then the developed media has a very valid predicate. On the feasibility aspect of the content, the researcher received comments and suggestions from the validator, namely an explanation of the parts of the material to be explained in the video, more detailed learning objectives, giving instructions on which parts to explain.

The animated video learning media is in accordance with the expected learning objectives and the material presented looks interesting. Learning media is also presented in an attractive way so as to increase learning motivation for students. Learning media is also considered to contain sequential material so that the material presented can be easily understood by students.

3.3.3 Validation of Learning Media by Biology Teachers

The validation of this research was carried out by showing an animated video via a laptop to be observed and giving a validation sheet to the biology subject teacher. The results of interactive e-book learning media research by teachers are presented in [Table 4](#).

Table 4. Results of validation of animated video learning media by biology teachers

No.	Rated aspect	Eligibility percentage (%)			Average (%)	Validity Level
		JL	AP	S		
1.	Appearance	90.00	100	90.00	93.33	Very Valid
2.	Audio	100	100	75.00	91.67	Very Valid
3.	Material/content	91.67	100	87.50	93.06	Very Valid
The average teacher's assessment of all aspects		93.89	100	84.17	92.69	Very Valid

Based on the [Table 4](#), it can be seen that the assessment of animated video learning media by the teacher has a feasibility rate that is Very Valid with an average validity percentage of 92.69%. The first assessment was carried out by the At-Ittihad Pekanbaru Biology teacher, namely (JP), the overall results were that this animated video learning media was very valid with a percentage of 93.89%. The second assessment was carried out by the PGRI Pekanbaru High School teacher, namely (AP), the overall result was that this animated video learning media was very valid with a percentage of 100%. The third assessment was carried out by the Riau Sports High School teacher, which was quite valid with a percentage of 84.17%. From the results of the assessment carried out by the teacher, there are teacher input and suggestions which will be analyzed by researchers to make improvements to this animated video learning media.

In the display aspect, there are five indicators, namely the opening title display, the opening animation display, image quality, color composition and moving media. From the validator (JL) the display aspect gets an average percentage of 90% with a very valid level of validity, from the validator (AP) the display aspect gets an average percentage of 100% with a very valid level of validity and from the validator (S) the aspect display gets an average percentage of 90% with a very valid level of validity. So that in terms of the appearance aspect of the device it is very valid to use.

In the Audio aspect, there is one indicator, namely the suitability of the sound with the picture. From the validator (JL) the display aspect gets an average percentage of 100% with a very valid validity level, from the validator (AP) the display aspect gets an average percentage of 100% with a very valid validity level and from the validator (S) the display aspect gets the average percentage is 75% with a fairly valid level of validity. So that in terms of the audio aspect the device is very valid to use.

In the material aspect, there are 6 indicators, namely the suitability of learning objectives, the relevance of learning objectives with base competence, the suitability of material with learning objectives, systematic and sequential, the language used and presentation of material. From the validator (JL) the display aspect gets an average percentage of 91.67% with a level of validity and very valid, from the display aspect validator (AP) gets an average percentage of 100% with a very valid level of validity and from the display aspect validator (S) gets an average percentage of 87.50% with very valid level of validity. Based on the results of the validation of the three teachers, animated video media is in accordance with the learning objectives and there is also a relevance of learning objectives with base competence. This explains that the material presented in the developed media is in accordance with the competency standards in the curriculum.

3.3.4 Student Response

Limited trials were conducted on three schools in Pekanbaru. Each school represents 10 students, so the number of students needed to conduct a limited trial of animated video

learning media is 30 students. The research sample was taken from students who had studied the Human Movement System material. At this stage the media used is media that has been validated in advance by experts. The instrument for students contains 12 questions consisting of 5 aspects, namely display aspects, audio aspects, device state aspects, learning aspects and material aspects. The trial was carried out by providing an animated video link that the researcher had previously uploaded on the Google Drive channel to students. Then students can provide an assessment through the Google form in which there is already an assessment questionnaire. Data on the results of student response assessments are presented in Table 5.

Table 5. Student response results

No.	Rated aspect	Eligibility percentage (%)			Average (%)	Eligibility Level
		SE1	SE2	SE3		
1.	Appearance	91.50	92.50	94.50	92.83	Very good
2.	Audio	95.00	90.00	100	95.00	Very good
3.	Learning	92.50	91.25	98.75	94.16	Very good
4.	Material/content	93.75	96.25	98.75	96.25	Very good
The average teacher's assessment of all aspects		93.18	92.50	98.00	94.56	Very good

Based on Table 5 it is known that the average percentage of student responses in the three schools as a whole is 94.56% and has a level of validity indicating the very good category. The details for each school are as follows: SE1 gets a percentage of 93.18%, this value indicates that students respond well to the use of the Human Movement System animated video media. SE2 gets a percentage of 92.50%, this value indicates that students respond well to the use of the Human Movement System animated video media. SE3 gets a percentage of 98.00%, this value indicates that students respond well to the use of the Human Movement System animated video media.

Based on Table 5 it can be seen that the average student response for all of the three schools is very good with a percentage of 94.56% and with a very valid validity level. The details for each school are SE1 of 93.18%. This large value indicates that students respond well to the use of animated video learning media for the Human Movement System material. SE2 of 92.50%. This large value indicates that students respond well to the use of animated video learning media for the Human Movement System material. And SE3 is 98.00%. This large value indicates that students respond well to the use of animated video learning media for the Human Movement System material.

Students say that this video animation media can help them understand the material of the movement system, especially in the material of the working mechanism of the muscles. Apart from that, it can be a source of learning for them while studying at home due to the current pandemic. In addition, the Riau Sports High School got the highest average score indicating that students at the school really needed this animated video media. This is because Sports High School students often come into contact with muscle material so that the developed media is very interesting. The following is a description of each student's response assessment of the animated video learning media.

Based on Table 5 it is known that the media aspect obtains a validity percentage of 94.56% with a very good level of validity. In the display aspect, there are 5 questions. In accordance with Table 5, it can be seen that students stated that learning media using animated videos was interesting and easy to understand. Students respond well to the animated video learning media that was developed because the animated video displays an attractive appearance.

Based on Table 5 it is known that the media aspect obtains a validity percentage of 94.56% with a very good level of validity. In the audio aspect, there is one question. According to the table, it can be seen that students stated that learning media using animated videos was interesting and easy to understand. Students responded well to the animated

video learning media that was developed. Based on the results of the percentage of participants who obtained the researcher on this learning media, it was said that students responded well to this audio learning media. It is intended that this learning media is able to help students understand the material because of the audio support that explains the material in this learning media. In line with what was said by [Muttaqien, \(2017\)](#) that learning media is a teaching and learning process aid.

Based on the table it is known that the media aspect obtains a validity percentage of 94.56% with a very good level of validity. In the learning aspect there are two questions. In accordance with the table, it can be seen that the students expressed learning media using interesting and easy-to-understand animated videos. Based on the table it is known that the media aspect obtains a validity percentage of 94.56% with a very good level of validity. In the material aspect, there are two questions. According to the table, it can be seen that students stated that learning media using animated videos was interesting and easy to understand because the delivery of material was outlined in the form of moving images. Learning by using video or animation is more successful because it is able to go through 2 human sensory sensors, namely the eyes and ears so that it makes students respond well to the animated video learning media that was developed.

4. Discussion

4.1 Stage 1: Analyze

The initial stage of this research is an analysis consisting of curriculum analysis, needs analysis and student analysis ([Rohman & Amri, 2013](#)). At this stage, it looks at the suitability of learning outcomes, learning materials and learning assessments with the applied curriculum ([Nadiyah & Faaizah, 2015](#)). Researchers conducted an analysis of the curriculum applied in schools as a reference in making animated video learning media. In addition, this stage also contains details of Core Competencies and Basic Competencies in the 2013 Curriculum ([Barbara & Bayu, 2021](#); [Sania et al., 2022](#)).

Next is the needs analysis stage which includes the availability of material in student textbooks, the types of learning media used, the availability of learning media in schools, and the percentage of needs for developing innovative learning media ([Barbara & Bayu, 2021](#)). Through this stage, it is known that the needs of students are more motivated to learn, such as the availability of audio-visual based learning media ([Sutarsih & Hermanto, 2017](#)). This needs analysis is also useful for finding solutions to the problems being analyzed ([Eka et al., 2022](#)). After that, an analysis of students is carried out to see the characteristics of students based on their knowledge, skills, and development ([Cahyadi, 2019](#)). The results of the student analysis will become the basis for knowing the characteristics of the students so that the media design can be developed according to the characteristics of the students ([Barbara & Bayu, 2021](#); [Izzaturahma et al., 2021](#)).

4.2 Stage 2: Design

This stage produces the user interface of product design ([Purnamasari, 2019](#)). The design stage consists of media designed in the form of animated videos consisting of learning objectives, materials, examples and also application in everyday life. This animated video learning media will be 10-15 minutes long which contains the movement system sub-material, namely muscle mechanics. This video animation learning media uses Indonesian and is also equipped with several filters and sound by making it using the Powtoon application to produce interesting videos. Powtoon learning media is an innovative learning media ([Ayu et al., 2019](#)). Powtoon is an application that can be used as a learning medium, Powtoon has lots of interesting animations and templates that make students not bored while learning ([Buchori & Cintang, 2018](#)).

There are several advantages in making Powtoon audio-visual media, including: practical use, there are many templates, animated content, fonts and transition effects are available, attractive, dynamic and interactive appearance, can be saved in MPEG, MP4, AVI formats or share directly on YouTube ([Akmalia et al., 2021](#); [Yuliantini, 2021](#)). In

addition to its advantages, Powtoon also has limitations, namely learning depends on the availability of technological support (gadgets, computers and the internet) and the duration is very short so that the delivery of material is limited (Anggita, 2021). Powtoon is an innovation and media that is very easy to make, namely a presentation in the form of moving animation and is equipped with background, handwritten animation and transitions which make the subject matter good and interesting so that it is easier for students to understand and understand (Dewi & Handayani, 2021; Graham, 2015). Powtoon animated video learning media serves to help provide explanations of material that is difficult to understand using interesting animations (Arnold, 2018). Powtoon has interesting animations that can be created so that they become quite interesting products (Sutarsih & Hermanto, 2017).

4.3 Stage 3: Development

The development stage has the goal of producing video animation learning media that is in accordance with the curriculum used, namely the 2013 curriculum. The learning media that has been prepared will be validated by the validator. In this development stage the conceptual framework can be realized in the form of product development that is ready to be implemented according to the objectives (Cahyadi, 2019). The results of this stage are expected that the teacher can produce a complete set of learning resources and learning media (Hidayat & Nizar, 2021). The development stage is the components that have been made previously from the analysis and design stages collected together and converted into ready-to-use media (Irwan et al., 2014).

4.3.1 Learning Media Validation by Media Experts

Media validation is done by displaying animated videos using a laptop and providing validation sheets to media experts. Appearance in a learning media must clarify, simplify, speed up the delivery of messages or learning materials to students (Rusman et al., 2012). According to Ridwan et al (2018), the use of Biology learning media that is capable of displaying visual objects can help Biology learning take place more interestingly, effectively and the knowledge gained can be stored longer.

4.3.2 Learning Media Validation by Material Experts

Material validation can be seen from the sequence of materials and study materials. Sania et al. (2022) based on the results of his research that the use of the Powtoon application was developed in accordance with the 2013 Curriculum which is based on core competencies, basic competencies, competency achievement indicators and learning objectives. According to Nurrita (2018) the use of learning media can foster students' interest in new things in learning delivered by the teacher so that they can be easily understood.

4.3.3 Validation of Learning Media by Biology Teachers

The role of validation is very important in the development of a product (Dewi & Handayani, 2021). Asyhar, (2012) states that the display in a learning media can add to the attractiveness of a material so as to increase motivation and interest and get the attention of students to focus on following the learning material. Ridwan et al (2018) states that the use of Biology learning media that is capable of displaying visual objects can help Biology learning take place more interestingly, effectively and the knowledge gained can be stored longer.

4.3.4 Student Response

The response of students to the media was very good. Based on the results of the validity percentage obtained by researchers on this learning media, it was said that students responded well to this audio learning media. This means that this learning media is able to help students understand the material because of the audio support that explains the material in this learning media. In line with what was said by Muttaqien, (2017) that learning media is a teaching and learning process aid. Ridwan et al (2018) says that quality

education in the full use of technology can have an impact on the progress of the world of education. Students respond well to the animated video learning media that was developed because the delivery of material uses technology.

Learning by using video or animation is more successful because it is able to go through 2 human sensory sensors, namely the eyes and ears so that it makes students respond well to the animated video learning media that was developed. An important role in using animated videos as learning media is the ability to visualize material that students cannot imagine and also makes it easier for teachers to deliver material (Ridwan et al, 2018; Wardana & Adlini, 2022). Based on research data that has been carried out from the three schools, it can be concluded that the animated video learning media developed is very good for use in the biology learning process at school. Overall, the results of the study show that the development of animated video media on the Human Movement System material at Pekanbaru High School can be categorized as very valid. The determination of this category is based on the results of the average percentage of assessments by material experts, media experts, teachers using validation sheets and also student response questionnaires that have been previously described.

5. Conclusions

Based on the results of the research that has been done, it is concluded that research on animated video learning media on the human movement system material that is developed as a whole is very valid with a percentage of the validation results of material experts of 90.62% (very valid), media experts of 90.77% (very valid) and teachers at 92.68% (very valid). This animated video learning media also received excellent responses from students in three schools. This can be seen from the average percentage of responses from students of 94.56% (very good). It can be said that from the overall assessment obtained from this animated video media, an average percentage of all validators is 92.15% with a very valid validity level. This also answers the objectives of the research carried out by researchers, namely to produce appropriate animated video learning media on human movement system material for class XI high school students in Pekanbaru. This research was only carried out up to the Development stage so that this research is expected to proceed to the Implementation and Evaluation stage.

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